ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 653823

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. USQ Required?	5. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	Juergen H. Rasmussen, Data Assessment and Interpretation, R2-12, 373-1128	[] Yes [X] No	06/01/99
	6. Project Title/No./Work Order No. Tank 241-B-202	7. Bldg./Sys./Fac. No. 241-B-202	8. Approval Designator N/A
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-WM-ER-371, Rev. 0-B	10. Related ECN No(s). ECNs: 643401, 649885	11. Related PO No. N/A

12a. Modification Work	12b. Work Package No.	12c. Modification Work Complete	12d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 12b) [X] No (NA Blks. 12b, 12c, 12d)	N/A	N/A Design Authority/Cog. Engineer Signature & Date	N/A Design Authority/Cog. Engineer Signature & Date

13a. Description of Change 13b. Design Baseline Document? [] Yes [X] No

This ECN has been generated in order to update the document to reflect results of recent data/information evaluation.

Replace pages:

ES-5 through ES-8, 1-1, 1-2, 5-7, 5-8, 6-1, 6-2, 7-1, and 7-2

14a. Justification (mark one)

Criteria Change	[X]	Design Improvement	[]	Environmental	[]	Facility Deactivation	[]
As-Found	[]	Facilitate Const	[]	Const. Error/Omission	[]	Design Error/Omission	[]

14b. Justification Details

A tank characterization report page change revision is required to reflect the results of recent evaluation of data/information pertaining to adequacy of tank sampling for safety screening purposes (Reynolds et al. 1999, Evaluation of Tank Data for Safety Screening, HNF-4217, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington).

15. Distribution (include name, MSIN, and no. of copies)

See attached distribution.

RELEASE STAMP

DATE JUN 4 1999

STA: 4

HANFORD RELEASE

ID: 58

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1): ECN-653823

16. Design Verification Required	17. Cost Impact				18. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
[ ] Yes	Additional	[ ] $	Additional	[ ] $	Improvement	[ ]
[X] No	Savings	[ ] $	Savings	[ ] $	Delay	[ ]

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD	[ ]	Seismic/Stress Analysis	[ ]	Tank Calibration Manual	[ ]
Functional Design Criteria	[ ]	Stress/Design Report	[ ]	Health Physics Procedure	[ ]
Operating Specification	[ ]	Interface Control Drawing	[ ]	Spares Multiple Unit Listing	[ ]
Criticality Specification	[ ]	Calibration Procedure	[ ]	Test Procedures/Specification	[ ]
Conceptual Design Report	[ ]	Installation Procedure	[ ]	Component Index	[ ]
Equipment Spec.	[ ]	Maintenance Procedure	[ ]	ASME Coded Item	[ ]
Const. Spec.	[ ]	Engineering Procedure	[ ]	Human Factor Consideration	[ ]
Procurement Spec.	[ ]	Operating Instruction	[ ]	Computer Software	[ ]
Vendor Information	[ ]	Operating Procedure	[ ]	Electric Circuit Schedule	[ ]
OM Manual	[ ]	Operational Safety Requirement	[ ]	ICRS Procedure	[ ]
FSAR/SAR	[ ]	IEFD Drawing	[ ]	Process Control Manual/Plan	[ ]
Safety Equipment List	[ ]	Cell Arrangement Drawing	[ ]	Process Flow Chart	[ ]
Radiation Work Permit	[ ]	Essential Material Specification	[ ]	Purchase Requisition	[ ]
Environmental Impact Statement	[ ]	Fac. Proc. Samp. Schedule	[ ]	Tickler File	[ ]
Environmental Report	[ ]	Inspection Plan	[ ]		[ ]
Environmental Permit	[ ]	Inventory Adjustment Request	[ ]		[ ]

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
N/A		

21. Approvals

	Signature	Date
Design Authority		
Cog. Eng. J.H. Rasmussen	[signature]	6/4/99
Cog. Mgr. K.M. Hall	Kathleen M. Hall	6/4/99
QA		
Safety		
Environ.		
Other		

	Signature	Date
Design Agent		
PE		
QA		
Safety		
Design		
Environ.		
Other		

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

Tank Characterization Report for Single-Shell Tank 241-B-202

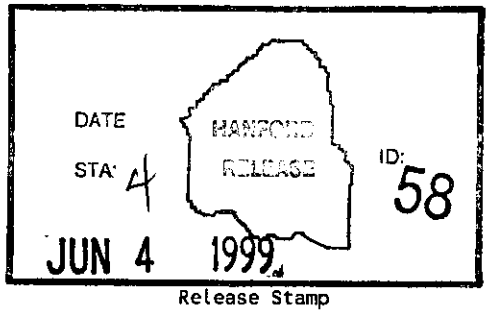
Juergen H. Rasmussen
Lockheed Martin Hanford Corp., Richland, WA 99352
U.S. Department of Energy Contract 8023764-9-K001

EDT/ECN: ECN-653823 UC: 2070
Org Code: 74B20 CACN/COA: 102217/EI00
B&R Code: EW 3120074 Total Pages: 100

Key Words: Waste Characterization, Single-Shell Tank, SST, Tank 241-B-202, Tank B-202, B-202, B Farm, Tank Characterization Report, TCR, Waste Inventory, TPA Milestone M-44

Abstract: N/A

6/4/99
Release Approval Date



Release Stamp

Approved for Public Release

RECORD OF REVISION	(1) Document Number WHC-SD-WM-ER-371	Page 1

(2) Title
Tank Characterization Report for Single-Shell Tank 241-B-202

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) Initially released 08/08/95 on EDT 612175.	M. J. Kupfer	K. M. Hodgson
0A RS	Incorporate per ECN-643401.	M. J. Kupfer	K. M. Hodgson
		M J Kupfer 6-15-97	K. M. Hodgson 8-18-99
0B RS	Incorporate per ECN-649885	M.J. Kupfer	K.M. Hodgson
		M J Kupfer 9-17-98	K.M. Hodgson 9-17-98
0-C RS	Incorporate per ECN-653823.	J.H. Rasmussen for	K.M. Hall
		J H Rasmussen	Kathleen M Hall 6/4/99

A-7320-005 (08/91) WEF168

Although the sampling and analysis of tank 241-B-202 were completed before the existence of the current data quality objectives (DQO), comparisons have been made between the sample analysis results from core samples taken in 1991 and the decision criteria thresholds outlined in the *Tank Safety Screening Data Quality Objective* (Babad and Redus 1994). The sampling and analysis were sufficient to satisfy the safety screening issue for tank 241-B-202 (Reynolds et al. 1999).

The differential scanning calorimetry (DSC) results showed a maximum exotherm of -348.4 J/g that is within the safety screening criteria (-481 J/g). The average percent water was 62 wt%, well within the 17 wt% criteria.[1] The heat generated by the radioactivity in the tank is estimated to be very low (0 Btu/hr) based on Brevick et al. (1995a). The highest recent recorded temperature for the tank has been approximately 18.9 °C (66 °F). The total alpha result (0.406 μCi/g) indicate that the plutonium concentration is well below the safety screening criteria of 1 g/L (50.8 μCi/g). Combustible gas meter (CGM) measurements indicated that the tank headspace flammable gas concentration is 0% of the lower flammability limit (LFL) (McCain and Bauer 1998).

Based on this information, there do not appear to be any immediate safety concerns relative to the waste in this tank.

[1]However the average of segment 2, core 24 was 21.6% with one value below 17% and the average of segment 5, core 24 was 12.9%. Segment 1, core 24 also had one aliquot value below 17% but the remaining values average well above 17%.

The concentration and tank inventory estimates for the sludge contained in tank 241-B-202 are summarized in Table ES-2 and are based on the Historical Tank Characterization Estimate (Brevick et al. 1995a). The major ion constituents include nitrate, phosphate, and fluoride. The major metal constituents in tank 241-B-202 waste include bismuth, sodium, iron, lanthanum, chromium, manganese, calcium, and potassium. The major radionuclides include ^{137}Cs, $^{239/240}Pu$, ^{237}Np, and $^{89/90}Sr$ (Kristofzski 1993).

The total alpha concentration (.406 μCi/g) is less than the criticality safety screening criteria of 1 g/L (50.8 μCi/g), as noted in Babad and Redus (1994), but is above transuranic levels (100 nCi/g). Data for tank 241-B-202 include physical measurements and water leach analysis that will support retrieval and pretreatment programs. Additional sample analysis was done for chemical and radiochemical analysis on the 1991 sample. However documentation errors make statistical analysis questionable for some of the data.

Table ES-2. Historical Tank Content Estimate for Tank 241-B-202.*

Physical properties		
Total waste	102 kL (27 kgal)	
Heat load	0 kW (0 Btu/hr)	
Bulk density	1.41 g/cc	
Void fraction	0.839	
wt% water	56.2	
TOC wt% (wet)	0.361	
Chemical constituents		
Analyte	**(μg/g)**	**(kg)**
Sodium	77,200	11,100
Chromium	278	39.9
Bismuth	18,100	2,600
Manganese	152	21.8
Potassium	6,210	893
OH^{-1}	80,800	11,600
NO_3^{-1}	61,300	8,810
PO_4^{-3}	10,700	1,540
F^{-1}	40,800	5,870
Oxalate	13,200	1,900
Radiological constituents		
Analyte	**(μCi/g)**	**(kg)**
Plutonium	0.007	0.02

Note: 1 Ci = 3.7 E+10 Bq.

*Brevick, C. H., L. A. Gaddis, and W. W. Pickett, 1995a, *Historical Tank Content Estimate for the Northeast Quadrant of the Hanford 200 West Areas*, WHC-SD-WM-ER-349, Rev. 0A, ICF Kaiser Hanford Company, Richland, Washington.

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1.0 INTRODUCTION

This tank characterization report presents an overview of single-shell tank 241-B-202 and its waste contents based on evaluation of historical information and sampling and analysis events. This report describes the results of three sampling events. Comparisons to data quality objective (DQO) criteria are based on core samples taken from the tank in June and July 1991. The results of a clear liquid waste sample taken in 1975 and of a sludge sample taken in 1978 also are discussed. Tank 241-B-202 is an out-of-service tank that has intrusion prevention controls in place restricting waste additions. The tank waste constituent concentrations and total inventory reported in this document are taken from the Historical Tank Content Estimate (Brevick et al. 1995a). Additional chemical and radiochemical analysis has been performed (Kristofzski 1993); however only data relative to current DQO requirements is summarized in this report. This report supports the requirements of the *Hanford Federal Facility Agreement and Consent Order*, Milestone M-44-08 (Ecology et al. 1994).

1.1 PURPOSE

The purpose of this report is primarily to summarize the information about the use and contents of tank 241-B-202. When possible, this information will be used to assess issues associated with safety, operations, environmental, and process development activities. This report also provides a reference point for more detailed information about tank 241-B-202.

1.2 SCOPE

This report presents the broad background information that was available before core sampling and that initially guided the development of the sampling and analysis program. This material includes process stream data, historical information about previous characterization testing, transfer records, and observations from in-tank photographs. The tank safety screen DQO related results from the 1991 core sample analyses are summarized. As characterization efforts proceed and additional information becomes available, this document will be revised periodically to reflect the new data.

The core samples taken in 1991 were intended to support several programs; safety assessment, process development activities for retrieval, pretreatment, disposal processes, and environmental issues. Chemical, radiochemical, and physical properties were measured on the core samples. Analyses were performed for volatile organic analysis (VOA), semi-VOA, and total organic halides. However, the use of normal paraffin hydrocarbon (NPH) and matrix interferences impacted data results. This document focuses primarily on the DQO-related data results. Additional information regarding the chemical and radiochemical analysis can be found in Kristofzski (1993). However documentation errors and data inconsistencies makes statistical analysis questionable and may limit the use of some of the data for some applications.

Field vapor space sampling using a CGM instrument in June 1996 showed that the tank headspace gases are at 0% of the LFL (McCain and Bauer 1998).

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The heat generation rate for the waste in tank 241-B-202 is very low because of the low concentration of isotopes. Historical records do not indicate any increasing or excessive temperature trends. Based on this information the waste in tank 241-B-202 does not appear to present a safety concern. The vapor space sampling using a field CGM determined that the tank headspace is at 0% of the LFL (McCain and Bauer 1998).

The assessment could be improved by the analysis of samples that are not potentially contaminated with NPH and from additional gravimetric water measurements at the segment level. The total alpha is well below the safety screening criteria.

The heat load results listed in Brevick et al. (1995a) show a heat load of 0 W. Thermocouple temperature readings from the tank possess very little offset from ambient and seasonal trends.

5.4.2 Operational Considerations

Tank 241-B-202 is out of service, has been interim stabilized and has been placed in an intrusion prevention condition. Therefore, waste transfers into or out of the tank prior to retrieval are physically restricted. Total alpha results indicate that the tank waste exceeds the transuranic (TRU) classification level of 100 nCi/g.

5.4.3 Environmental Evaluation

Tank 241-B-202 waste has been characterized to meet regulatory requirements that the waste be safely stored and managed; it has not been characterized to designate the waste or for evaluation of any environmental compliance issues. Volatile and semivolatile analyses have been performed on the tank (Kristofzski 1993). However, holding times and problems encountered with the procedures make the data unsuitable for regulatory purposes.

The 1991 analysis (Kristofzski 1993) indicates that the pH is 12.3. Analysis also indicates that the sludge contains environmentally sensitive metals such as chromium, lead, cadmium, and silver.

5.4.4 Process Development Evaluation

The metal analyses of the sludges are important for evaluating the disposal waste form (glass) formulations and for identifying potential components that may affect the treatment and disposal process. Because the waste sludges may be blended, washed, and treated before disposal, there are no specific criteria for the parameters measured. The 1991 physical measurements will be important in evaluating retrieval and pretreatment process equipment needs.

Note that many of the metals that are important in optimizing the amount of high level waste are not soluble, thus more sophisticated pretreatment operations may need to be considered. Alternatively, this waste is so low in radionuclide content that remote operations in retrieval and pretreatment may not be necessary, or this waste may be used to "blend down" more active wastes.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Tank 241-B-202 has a relatively simple process history. The tank went into service in 1948 receiving 224 waste from bismuth phosphate process operations at B Plant. Other waste types added over the course of the tank's service include B Plant flush water, uranium-bearing waste from the first extraction cycle in B Plant metal waste, waste from B plant cell 5, tank 6, high-level B Plant waste, and flush water.

Water is the principal constituent of the samples. The other major waste constituents include iron, bismuth, calcium, chromium, lanthanum, manganese, potassium, sodium, nitrate, phosphate, and fluoride. The major radionuclides include ^{137}Cs, $^{239/240}Pu$, ^{237}Np, and $^{89/90}Sr$.

Sampling and analysis of tank 241-B-202 was sufficient to meet the safety screening requirements (Reynolds et al. 1999). Historical and analytical information tend to indicate that the tank is within established operating safety limits as defined by applicable DQOs. Core 25, segment 2 was reanalyzed because a later review of the DSC data indicated a exotherm that produced energy in excess of the tank safety screening criteria. Subsequent analyses of the waste yielded results that were modestly exothermic but well within the safety limit. TOC and cyanide analysis of water leached waste (Kristofzski 1993) do not indicate the presence of excessive fuel. Even though the TGA weight percent water for several waste aliquots were below 17%, the segment level gravimetric weight percent water results indicate the moisture level is well above 17%.

The heat load results listed in Brevick et al. (1995a) show a heat load of 0 W. Thermocouple temperature readings from the tank do not indicate any excessive waste temperatures.

In summary, tank 241-B-202 is out of service, has been interim stabilized, has been placed in an intrusion prevention condition, and does not appear to have any immediate safety issues. The vapor space was at 0% of the LFL when analyzed with a field CGM (McCain and Bauer 1998). The total alpha results show the waste is above the TRU levels classification but well below the criticality criteria. In addition, although the tank is classified as sound, it is presently undergoing evaluation for possible intrusion of liquid into the tank.

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DISTRIBUTION SHEET

To	From	Page 1 of 2
Distribution	Data Assessment and Interpretation	Date 06/01/99
Project Title/Work Order		**EDT No.** N/A
Tank Characterization Report for Single-Shell Tank 241-B-202, WHC-SD-WM-ER-371, Rev. 0-C		**ECN No.** ECN-653823

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
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Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
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ERC (Environmental Resource Center)	R1-51	X			
T.C.S.R.C.	R1-10	5			
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